IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

BEST MEDICAL INTERNATIONAL, INC., *Plaintiff*, v. VARIAN MEDICAL SYSTEMS, INC., AND VARIAN MEDICAL SYSTEMS INTERNATIONAL AG, *Defendants*.	)	Civil Action No.: 1:18-cv-1599-MN JURY TRIAL DEMANDED

FIRST AMENDED COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Best Medical International, Inc. ("Plaintiff" or "Best"), by and through its undersigned counsel, for its first amended complaint against Defendants Varian Medical Systems, Inc. ("Varian Inc.") and Varian Medical Systems International AG ("Varian AG") (together, "Defendants"), hereby alleges and states the following:

PARTIES

1. Plaintiff Best Medical International, Inc. is a corporation organized under the laws of the Commonwealth of Virginia with a principal place of business located at 7643 Fullerton Road, Springfield, Virginia 22153.

2. Best is the owner by assignment of the entire right, title, and interest in and to U.S. Patent No. 6,038,283 ("the '283 Patent"), titled "Planning Method and Apparatus for Radiation Dosimetry." A copy of the '283 Patent is attached hereto as **Exhibit A**.

3. Best is the owner by assignment of the entire right, title, and interest in and to U.S. Patent No. 6,393,096 ("the '096 Patent"), titled "Planning Method and Apparatus for Radiation Dosimetry." A copy of the '096 Patent is attached hereto as **Exhibit B**.

4. Best is the owner by assignment of the entire right, title, and interest in and to U.S. Patent No. 7,266,175 ("the '175 Patent"), titled "Planning Method for Radiation Therapy." A copy of the '175 Patent is attached hereto as **Exhibit C**.

5. Best is the owner by assignment of the entire right, title, and interest in and to U.S. Patent No. 7,015,490 ("the '490 Patent"), titled "Method and Apparatus for Optimization of Collimator Angles in Intensity Modulated Radiation Therapy Treatment." A copy of the '490 Patent is attached hereto as **Exhibit D**.

6. Best, through Best Nomos®, sells an external beam treatment planning system, Corvus®, that incorporates embodiments of the patented technologies of the '283 Patent, the '096 Patent, the '175 Patent, and the '490 Patent (together, the "Patents-In-Suit").

7. Defendants are competitors of Best in the field of radiotherapy.

8. Upon information and belief, Defendant Varian Medical Systems, Inc. is a corporation organized and existing under the laws of the State of Delaware with its principal place of business at 3100 Hansen Way, Palo Alto, California 94304.

9. Upon information and belief, Defendant Varian Medical Systems, Inc. makes, uses, sells, offers for sale in the United States and imports into the United States hardware, software, and professional services for radiation treatment, including the Clinac® linear accelerator, Clinac® iX linear accelerator, VitalBeam® Radiotherapy System, Trilogy® System, TrueBeam® Radiotherapy System, and Halcyon™ Radiotherapy System, Eclipse™ Treatment

Planning System, RapidPlan™ Knowledge-Based Planning System, and RapidArc® Planning System.

10. Upon information and belief, Defendant Varian Medical Systems International AG is a foreign corporation organized under the laws of Switzerland with a principal place of business at Hinterbergstrasse 14, 6312 Steinhausen, Switzerland.

11. Upon information and belief, Defendant Varian Medical Systems International AG makes, uses, sells, offers for sale in the United States and/or imports into the United States Clinac® linear accelerator, Clinac® iX linear accelerator, VitalBeam® Radiotherapy System, Trilogy® System, TrueBeam® Radiotherapy System, and Halcyon™ Radiotherapy System, Eclipse™ Treatment Planning System, RapidPlan™ Knowledge-Based Planning System, and RapidArc® Planning System.

JURISDICTION AND VENUE

12. This is an action for patent infringement arising under the patent laws of the United States, Title 35, United States Code, §§ 100 *et seq*.

13. This Court has subject matter jurisdiction over this action pursuant to 28 U.S.C. §§ 1331 and 1338(a).

14. This Court has personal jurisdiction over Defendants in that each has, directly or through its agents and/or intermediates, committed acts within Delaware giving rise to this action and has established minimum contacts with Delaware such that the exercise of jurisdiction would not offend traditional notions of fair play and substantial justice.

15. Defendant Varian Medical Systems, Inc. has also purposefully availed itself of the courts of this venue, having brought, *e.g.*, Civil Action 1:15-cv-00871-LPS and Civil Action

1:16-cv-00994-RGA, in the federal courts of the District of Delaware. The use of the courts of this jurisdiction is sufficient to give rise to jurisdiction over Defendant Varian Medical Systems, Inc.

16. Upon information and belief, each of Defendants regularly conducts business in Delaware and purposefully avails itself of the privileges of conducting business in Delaware. In particular, upon information and belief, each of Defendants directly and/or through its agents and/or intermediates makes, uses, imports, offers for sale, sells, and/or advertises its products and affiliated services in Delaware.

17. Upon information and belief, each of Defendants has committed patent infringement in Delaware that has led to foreseeable harm and injury to Plaintiff. Upon information and belief, each of Defendants derives substantial revenue from the sale of infringing products distributed within Delaware and/or expects or should reasonably expect its actions to have consequences within Delaware. In addition, upon information and belief, each of Defendants knowingly induced and contributed to, and continue to knowingly induce and contribute to, infringement of one or more of the Patents-In-Suit within Delaware by offering for sale, selling, and/or contracting with others to market infringing products with the knowledge and intent to facilitate infringing use of the products by others within Delaware and by creating and/or disseminating product information and other materials providing instructions for infringing use.

18. In addition, Defendant Varian Medical Systems International AG is subject to jurisdiction in the United States, and specifically in Delaware, pursuant to FED. R. CIV. P. 4(k)(2). Varian Medical Systems International AG has contacts with the United States that include, but are not limited to, advertising, offering to sell, and/or selling infringing products and

software and related products therefor throughout the United States, including in Delaware and this Judicial District.

19. This Court also has personal jurisdiction over Defendant Varian Medical Systems, Inc. by virtue of it being an entity organized and existing under the laws of the State of Delaware, and thus resident within this Judicial District.

20. This Court also has personal jurisdiction over both Defendants due to their failure to move for dismissal of Plaintiff's original complaint based on a lack of personal jurisdiction within this District when Defendants otherwise moved for dismissal pursuant to Rule 12, FED. R. CIV. P.

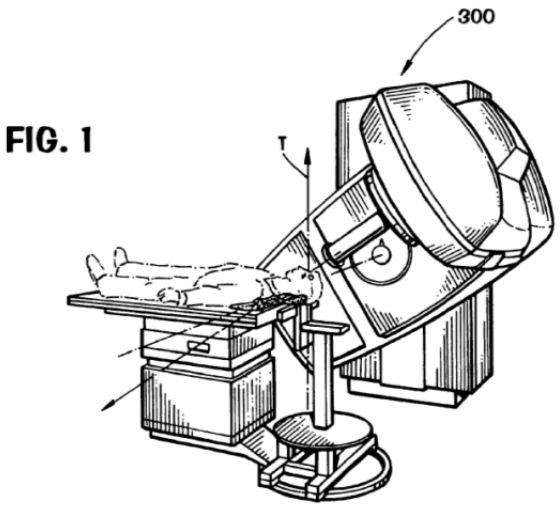
21. Venue is proper in this Court under 28 U.S.C. §§ 1391(b), 1391(c), 1391(d), and/or 1400(b). In addition, neither Defendant contested the venue of this action.

BACKGROUND OF THE PATENTS-IN-SUIT

22. The Patents-In-Suit list "Nomos Corporation" as the assignee. Nomos, founded in 1992, was a leading supplier of, *inter alia*, planning and delivery technology for intensity modulated radiation therapy ("IMRT"). As an example, Nomos' Non-Invasive Scalpel™ IMRT allowed escalated radiation doses to be delivered to a tumor while limiting exposure and damage to nearby healthy tissue. On or about October 2003, North American Scientific, Inc. ("NASI") acquired Nomos Corporation, including the Patents-In-Suit, to expand its position in the radiation oncology market. On or about September 11, 2007, Best purchased the assets, including but not limited to the Patents-In-Suit, relating to the NOMOS Radiation Oncology Division of Nomos Corporation from NASI ("Nomos Assets"). Best subsequently created Best Nomos, a division of Best, and transferred the Nomos Assets into Best Nomos. Utilizing the

Nomos Assets, Best Nomos® designs products and solutions that help medical professionals treat a variety of cancers. Those products and solutions accurately plan, target, and deliver radiation treatments to patients all over the world.

23. The Patents-In-Suit relate to radiation therapy for the treatment of tumors. When treating tumors via "conformal radiation therapy," two major goals include (i) eradicating the tumor and (ii) minimizing damage to healthy tissue and organs located near the tumor. Conformal radiation therapy typically uses a linear accelerator ("LINAC") as the source of the radiation beam used to treat the tumor. The radiation beam source of a LINAC was historically rotated about a patient and the beam directed toward the tumor to be treated.



See Exhibit A, Figure 1, col. 8, ll. 32-34 (depicting a "conventional linear accelerator, including a rotatable couch, collimator and gantry"). Approaches for conformal radiation therapy prior to the Patents-In-Suit included using multi-leaf collimators, which have multiple leaf, or finger, projections that can be moved individually into and out of the path of the radiation beam to form an outline of the tumor shape in an effort to block radiation from transmitting outside a tumor's spatial outline. Another approach involved using collimator jaws, which can scan a slit field across a stationary patient at the same time that a separate set of collimator jaws follows the

target volume as the gantry of the LINAC rotates. Yet another approach has been the use of narrow pencil beams of high energy photons, whose energy can be varied, and the beams are scanned over the tumor target volume so as to deliver the best possible radiation dose distribution in each orientation of the gantry upon which the photon beam source is mounted.

24. Yet, all approaches encountered major problems associated with the morphology of tumors and their surroundings. For example, radiation beam intensity needed to be higher for a thick section of a tumor than for a thin section. While attempts were made to combat these problems using, *e.g.*, dedicated scanning beam therapy where beam intensity is modulated by increasing the power of its electron gun generating the beam, such attempts were expensive, time-consuming, and not optimal. Moreover, plans for maximizing eradication of tumor volume while minimizing the amount of radiation delivered to surrounding structures were woefully insufficient.

25. The Patents-In-Suit represent a tremendous advance in radiation therapy by maximizing eradication of a tumor while minimizing damage to healthy tissue and organs located near the tumor.

26. The advances in radiation treatment offered by the Patents-In-Suit swept through the industry, and, upon information and belief, Defendants eventually adopted and copied Best's technologies as claimed in the Patents-in-Suit.

27. The inventions of the Patents-In-Suit are embodied in Best's Corvus® treatment planning system.

28. Corvus® is a specialized treatment planning system, which includes a computer and software that, in combination with existing LINACs, delivers conformal radiation therapy to tumors while at the same time optimizing the treatment to minimize the harm to other structures.

29. Nomos Corporation brought Corvus® to market and revolutionized conformal radiation therapy. Embodiments of the technology of the Patents-In-Suit included in Corvus® enabled radiation oncologists and other clinicians to optimize radiation therapy by balancing competing costs and benefits through a cost-function utilizing partial volume data to determine an optimized beam arrangement that minimizes the dangers of radiation to healthy tissues versus delivering a fully-prescribed dose to the tumor and other targets.

30. Corvus® is an inverse treatment planning system that optimizes the delivery of radiation, such as the delivery of a treatment plan of thousands of pencil beams of radiation, to meet prescription dose goals and constraints. Corvus® provides the ability to manipulate isodose lines after plan determination to improve the plan with immediate, graphical feedback. It also enhances productivity by eliminating the iterative trial and error process of generating the perfect treatment plan, thus increasing accuracy and safety while saving patient and clinician time.

31. Corvus® includes a bundle of tools known as ActiveRx™, which are used to optimize the delivery of radiation. For example, ActiveRx™ allows treatment providers to manipulate isodose lines directly on CT scans and interactively "push" dose out of sensitive structures. This technology is used for IMRT treatments using thousands of beams to produce treatment plan results in seconds. This allows clinicians to quickly understand the subtle interplays of competing goals and move directly to the point of best balance for their patients.

32. At all relevant times, Corvus® has been marked with the then-issued Patents-In-Suit.

33. Defendants are the world's leading manufacturer of medical devices and software for treating cancer and other medical conditions with radiotherapy, radiosurgery, proton therapy, and brachytherapy. Defendants' apparatuses include hardware and software technology for

radiation treatments that are widely used on a global basis. Defendants' treatment planning systems and software work in concert with Defendants' apparatuses to not only create treatment plans, including individualized radiation treatment plans, but also to control the delivery of radiation to the tumor.

DEFENDANTS' KNOWLEDGE OF THE PATENTS-IN-SUIT

34. At all times relevant to this patent infringement action, the Defendants have known of the Patents-In-Suit.

35. Between 1997 and the early 2000's, Varian, Inc. and Nomos Corporation worked closely together with one another in relation to optimization of radiation delivery. For example, Varian, Inc. would send Nomos Corporation their model files, which included certain specifications regarding the Varian LINACs and corresponding multi-leaf collimators, such as geometric angles of the collimator, leaf thickness, distance from source to collimator/patient and other details required for dose calculation and to create the beam model, so that Nomos Corporation could allow Corvus® inverse treatment planning system to operate in conjunction with Varian's LINACS and its associated collimators. Once Nomos Corporation created the Beam Model for use in Corvus® to operate in conjunction with Varian's LINACs, the Varian LINACs were able to be used to deliver the radiation treatment plan tailored for a particular patient with optimized radiation beam arrangement and radiation delivery to the patient.

36. On January 26, 2012, well after each of the Patents-In-Suit had issued, Defendants approached Best regarding potentially licensing technologies covered by the Patents-In-Suit. In an email dated January 26, 2012, Jeff Marcus of Varian sent an email to Best's CEO, Krish Suthanthiran, seeking a meeting to discuss possible collaboration using Best's

technologies. *See* Exhibit S. Mr. Marcus also introduced Corey Zankowski, PhD, then Varian's Vice President, Product Management.

37. In further email and verbal communications, Defendants expressed their interest through representatives Dr. Zankowski and Mr. Marcus. In an email communication dated January 26, 2012, Dr. Zankowski and Mr. Marcus approached Best to discuss "interface issues between your [Best] products and Varians [*sic*]." *See* Exhibit S.

38. Dr. Zankowski, via email dated February 9, 2012, indicated a desire to set up a meeting between Jeff Amacker, Varian's "Sr. Director of Clinical Solutions, which includes Eclipse treatment planning system," and "the person at Team BEST who handles your [Best's] Nomos treatment planning system." *See* Exhibit S.

39. At or about February 9, 2012, Varian's Clinical Solutions had responsibility for the Eclipse treatment planning system.

40. Defendants' and Best's representatives participated in a teleconference on February 16, 2012, during which representatives of the parties, including Dr. Zankowski for Varian and Krish Suthanthiran for Best, discussed Best Nomos technologies, including the Best patent portfolio related to the Corvus® treatment planning system.

41. As of February 16, 2012, each of the Patents-In-Suit was publicly known as covering aspects of Corvus® due at least to patent marking.

42. On April 5, 2012, Best's then in-house counsel O'Neal Mistry emailed Dr. Zankowski of Varian as "Intellectual Property Counsel for Team BEST" in furtherance of the earlier discussions. *See* Exhibit S.

43. Defendants' representative Paul Meskell, then Product Manager, Clinical Solutions, emailed in response on April 11 that Varian was "exploring" technology that "may be covered by the Best NOMOS patent portfolio." *See* Exhibit S.

44. Defendants' ongoing communication with Plaintiff demonstrated that Varian, at least as of January 26, 2012, knew of Best's patent portfolio covering Corvus®, and that the portfolio included, in 2012, each of the Patents-In-Suit.

45. Defendants' knowledge of the Patents-In-Suit is further confirmed by knowledge gained through the patent prosecution process, including prosecution of patents owned by Defendants and during the prosecution of which, each of the Patents-In-Suit is cited.

46. As demonstrated in paragraphs 47-67, three of the Patents-In-Suit has been cited by Varian scientists in patents applied for and assigned to Varian.

47. Varian's knowledge of the '283 Patent is demonstrated by citations to the '283 Patent during the course of patent prosecution of at least the eight Varian-assigned patents below.

48. For example, U.S. Patent No. 6,327,490 issued on December 4, 2001 and was assigned to Varian Medical Systems, Inc. on December 6, 2000. The 6,327,490 patent cites to the '283 Patent and demonstrates Varian's knowledge of the '283 Patent. *See* U.S. Patent No. 6,327,490, p. 2.

49. Similarly, U.S. Patent No. 6,360,116 issued on March 19, 2002 and was assigned to Varian Medical Systems, Inc. on December 6, 2000. The 6,360,116 patent cites to the '283 Patent and demonstrates Varian's knowledge of the '283 Patent. *See* U.S. Patent No. 6,360,116, p. 2.

50. U.S. Patent No. 9,498,167 issued on November 22, 2016 and was assigned to

Varian Medical Systems, Inc. on October 10, 2008. The 9,498,167 patent cites to the '283 Patent and demonstrates Varian's knowledge of the '283 Patent. *See* U.S. Patent No. 9,498,167, p. 2. Further, the '283 Patent became of record in the prosecution leading to the 9,498,167 patent through an Information Disclosure Statement ("IDS") filed by the applicant on May 1, 2006.

51. U.S. Patent No. 10,004,650 issued on June 26, 2018 and was assigned to Varian Medical Systems, Inc. on October 6, 2008. The 10,004,650 patent cites to the '283 Patent and demonstrates Varian's knowledge of the '283 Patent. *See* U.S. Patent No. 10,004,650, p. 2. Further, the '283 Patent became of record in the prosecution leading to the 10,004,650 patent through an IDS filed by the applicant on November 16, 2007.

52. U.S. Patent No. 7,986,768 issued on July 26, 2011 and was assigned to Varian Medical Systems International AG on May 20, 2009. U.S. Patent No. 7,986,768 cites to the '283 Patent and demonstrates Varian's knowledge of the '283 Patent. *See* U.S. Patent No. 7,986,768, p. 1. Further, the '283 Patent became of record in the prosecution leading to the 7,986,768 patent through an IDS filed by the applicant on February 19, 2009.

53. U.S. Patent No. 8,085,899 issued on December 27, 2011 and was assigned to Varian Medical Systems International AG on December 12, 2007. U.S. Patent No. 8,085,899 cites to the '283 Patent and demonstrates Varian's knowledge of the '283 Patent. *See* U.S. Patent No. 8,085,899, p. 1. Further, the '283 Patent became of record in the prosecution leading to the 8,085,899 patent through an IDS filed by the applicant on December 12, 2007.

54. U.S. Patent No. 9,907,979 issued on March 6, 2018 and was assigned to Varian Medical Systems International AG on September 9, 2008. U.S. Patent No. 9,907,979 cites to the '283 Patent and demonstrates Varian's knowledge of the '283 Patent. *See* U.S. Patent No. 9,907,979, p. 1. Further, the '283 Patent became of record in the prosecution leading to the

9,907,979 patent through an IDS filed by the applicant on September 9, 2008.

55. U.S. Patent No. 10,252,081 issued on April 9, 2019 and was assigned to Varian Medical Systems International AG on September 30, 2015. U.S. Patent No. 10,252,081 cites to the ’283 Patent and demonstrates Varian’s knowledge of the ’283 Patent. *See* U.S. Patent No. 10,252,081, p. 1.

56. Varian knowledge of the ’096 Patent is demonstrated by citations to the ’096 Patent during the course of patent prosecution of at least the seven Varian-assigned patents below.

57. U.S. Patent No. 9,498,167 issued on November 22, 2016 and was assigned to Varian Medical Systems, Inc. on October 10, 2008. The 9,498,167 patent cites to the ’096 Patent and demonstrates Varian’s knowledge of the ’096 Patent. *See* U.S. Patent No. 9,498,167, p. 3. Further, the ’096 Patent became of record in the prosecution leading to the 9,498,167 patent through an IDS filed by the applicant on May 1, 2006.

58. U.S. Patent No. 9,919,165 issued on March 20, 2018 and was assigned to Varian Medical Systems, Inc. on October 20, 2015. The 9,919,165 patent cites to the ’096 Patent and demonstrates Varian’s knowledge of the ’096 Patent. *See* U.S. Patent No. 9,919,165, p. 2. Further, the ’096 Patent became of record in the prosecution leading to the 9,919,165 patent through an IDS filed by the applicant on May 7, 2014.

59. U.S. Patent No. 9,943,704 issued on April 17, 2018 and was assigned to Varian Medical Systems, Inc. on November 16, 2011. The 9,943,704 patent cites to the ’096 Patent and demonstrates Varian’s knowledge of the ’096 Patent. *See* U.S. Patent No. 9,943,704, p. 2. Further, the ’096 Patent became of record in the prosecution leading to the 9,943,704 patent through an Information Disclosure Statement (“IDS”) filed by the applicant on September 18,

2009.

60. U.S. Patent No. 10,004,650 issued on June 26, 2018 and was assigned to Varian Medical Systems, Inc. on October 6, 2008. The 10,004,650 patent cites to the ’096 Patent and demonstrates Varian’s knowledge of the ’096 Patent. *See* U.S. Patent No. 10,004,650, p. 2. Further, the ’096 Patent became of record in the prosecution leading to the 10,004,650 patent through an IDS filed by the applicant on November 16, 2007.

61. U.S. Patent No. 8,085,899 issued on December 27, 2011 and was assigned to Varian Medical Systems International AG on December 12, 2007. U.S. Patent No. 8,085,899 cites to the ’096 Patent and demonstrates Varian’s knowledge of the ’096 Patent. *See* U.S. Patent No. 8,085,899, p. 1. Further, the ’096 Patent became of record in the prosecution leading to the 8,085,899 patent through an IDS filed by the applicant on December 12, 2007.

62. U.S. Patent No. 10,043,284 issued on August 7, 2018 and was assigned to Varian Medical Systems, Inc. The 10,043,284 patent cites to the ’096 Patent and demonstrates Varian’s knowledge of the ’096 Patent. *See* U.S. Patent No. 10,043,284, p. 2. Further, the ’096 Patent became of record in the prosecution leading to the 10,043,284 patent through an IDS filed by the applicant on May 7, 2014.

63. U.S. Patent No. 10,252,081 issued on April 9, 2019 and was assigned to Varian Medical Systems International AG on September 30, 2015. U.S. Patent No. 10,252,081 cites to the ’096 Patent and demonstrates Varian’s knowledge of the ’096 Patent. *See* U.S. Patent No. 10,252,081, p. 1.

64. As detailed above, Defendants had knowledge of the ’175 Patent and their infringement thereof by no later than January 26, 2012.

65. Varian’s knowledge of the ’490 Patent is demonstrated by citations to the ’490

Patent during the course of patent prosecution of at least the two Varian-assigned patents below.

66. U.S. Patent Application Publication No. 2017/0095678 published on April 6, 2017 and was assigned to Varian Medical Systems International AG on July 03, 2017. During the prosecution of U.S. Patent Application Publication No. 2017/0095678, the examiner cited to U.S. Patent Application Publication No. 2005/0123098, which is the patent application publication for the '490 Patent. *See* 2017-07-06 list of references cited by examiner for U.S. Patent Application Publication No. 2017/0095678; U.S. Patent No. 7,015,490. This demonstrates Varian's knowledge of the '490 Patent.

67. U.S. Patent No. 10,307,615 issued on June 4, 2019 and was assigned to Varian Medical Systems International AG on January 12, 2017. The 10,307,615 patent cites to International Publication Number WO 2005/018742, which claims priority to U.S. Application No. 10/915,968. The '490 Patent derives from U.S. Application No. 10/915,968. *See* U.S. Patent No. 10,307,615, p. 1; WO 2005/018742, p. 1.

COUNT 1: DIRECT INFRINGEMENT OF THE '283 PATENT

68. Plaintiff incorporates by reference paragraphs 1-67 as if set forth fully herein.

69. This cause of action arises under the patent laws of the United States, including 35 U.S.C. §§ 271 *et seq*.

70. The '283 Patent was duly and lawfully issued by the United States Patent and Trademark Office ("USPTO") on March 14, 2000, to listed co-inventors Mark P. Carol, Robert C. Campbell, Bruce Curran, Richard W. Huber, and Richard V. Nash. *See Exhibit A, Cover.*

71. Plaintiff is the owner by assignment of all right, title, and interest in and to the '283 Patent. Evidence of the assignment of the '283 Patent from the co-inventors to Nomos

Corporation is recorded at the USPTO at Reel 012973, Frame 0723 and from Nomos Corporation to Plaintiff at Reel 020062, Frame 0709.

72. The ’283 Patent is titled “Planning Method and Apparatus for Radiation Dosimetry.” *See Exhibit A, Cover*.

73. The ’283 Patent is directed to, *inter alia*, methods and apparatuses for determining an optimized radiation beam arrangement for applying radiation to a tumor target volume while minimizing radiation of a structure volume in a patient. *See Exhibit A, Abstract*. One of the [1] apparatuses for determining an optimized radiation beam arrangement for applying radiation to a tumor target volume while minimizing radiation of a structure volume in a patient claimed in the ’283 Patent comprises [2] a computer, [3] adapted to computationally obtain a proposed radiation beam arrangement, the computer [4] adapted to computationally change the proposed radiation beam arrangement iteratively, wherein the proposed radiation beam arrangement is changed by changing the beam weights, the computer being [5] further adapted to incorporate a cost function at each iteration to approach correspondence of partial volume data associated with the proposed radiation beam arrangement to partial volume data associated with a pre-determined desired dose prescription and the computer being [6] further adapted to reject the change of the proposed radiation beam arrangement if the change of the proposed radiation beam arrangement leads to a lesser correspondence to the desired dose prescription and to accept the change of the proposed radiation beam arrangement if the change of the proposed radiation beam arrangement leads to a greater correspondence to the desired dose prescription to obtain an optimized radiation beam arrangement. *See Exhibit A, Claim 25*.

74. As detailed in paragraphs 34-67 above, Defendants had knowledge of the ’283 Patent and their infringement thereof by no later than January 26, 2012.

75. Upon information and belief, each of the Defendants has directly infringed, literally and/or under the doctrine of equivalents, under 35 U.S.C. 271(a), one or more claims of the '283 Patent, including at least Claims 6, 7, 9, 10, 12, 22-28, 34, 42, and 46 of the '283 Patent, by making, using, selling, offering for sale, importing, and/or advertising in the United States at least Defendants' Clinac® linear accelerator (*see Exhibit E*), Clinac® iX linear accelerator (*see Exhibit R*), VitalBeam® Radiotherapy System (*see Exhibit F*), Trilogy® System (*see Exhibit G*), TrueBeam® Radiotherapy System (*see Exhibit H*), and Halcyon™ Radiotherapy System (*see Exhibit Q*), in conjunction with at least Defendants' Eclipse™ Treatment Planning System (*see Exhibit I*) and/or Defendants' RapidPlan™ Knowledge-Based Planning System (*see Exhibit J*) and/or Defendants' RapidArc® Planning System (*see Exhibit K*) ("the Accused Products").

76. Upon information and belief, Defendants' linear accelerators, including the Clinac® linear accelerator, Clinac® iX linear accelerator System, VitalBeam® Radiotherapy System, Trilogy® System, TrueBeam® Radiotherapy System, and Halcyon™ Radiotherapy System, in conjunction with at least Defendants' Eclipse™ Treatment Planning System and/or Defendants' RapidPlan™ Knowledge-Based Planning System and/or Defendants' RapidArc® Planning System, provide apparatuses as set forth in at least Claims 6, 7, 9, 10, 12, 22-28, 34, 42, and 46 of the '283 Patent.

77. Upon information and belief, Defendants' Clinac® linear accelerator system is [1] an apparatus for determining an optimized radiation beam arrangement for applying radiation to a tumor target volume while minimizing radiation of a structure volume in a patient. As noted in their brochure, the Clinac® linear accelerator system allows their users to "quickly deliver a wide range of radiation therapy to your patients including Intensity Modulated Radiotherapy (IMRT), Image-Guided Radiotherapy (IGRT), Volumetric Modulated Arc Therapy (VMAT),

RapidArc® and stereotactic radiosurgery" which gives "the flexibility to shape the beam while controlling the dose rate and the gantry speed for a highly conformed dose." *See Exhibit E, pp. 4, 7.* The system allows one to "quickly and accurately deliver powerful treatments . . . while reducing the risk to surrounding healthy tissue." *See Exhibit E, p. 7.*

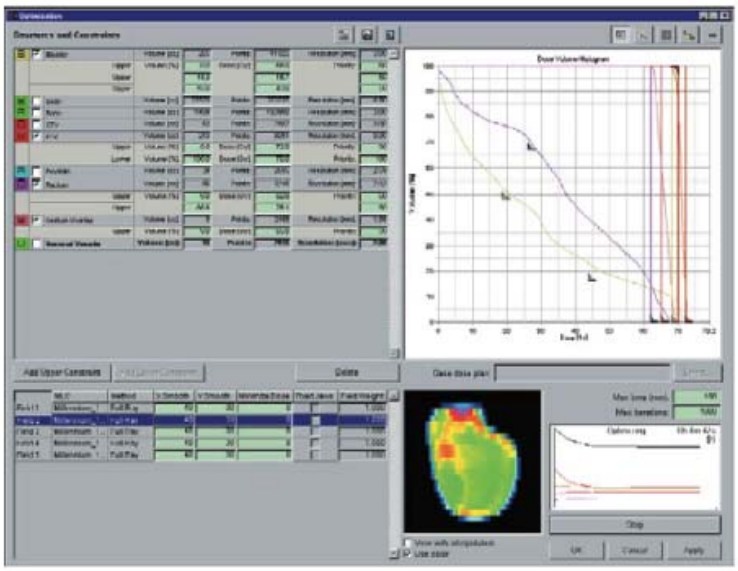
78. Upon information and belief, Defendants' Clinac® linear accelerator system includes a [2] computer that [3] obtains a proposed radiation beam arrangement and [4] changes the proposed radiation beam arrangement iteratively, wherein the proposed radiation beam arrangement is changed by changing the beam weights and [5] incorporates a cost function and [6] rejects changes if there is lesser correspondence and accepts changes if there is greater correspondence to the desired dose prescription. As noted in their brochure, the Clinac® linear accelerator system keeps "the treatment process connected through integration with treatment planning and information management software." *See Exhibit E, p. 4.* As noted in a Clinac® case study, Defendants' RapidArc® Planning System can be used to create an "[i]mage-guided dosimetric assessment," obtain proposed radiation beam arrangements, verify positioning, and select the plan with greater conformation with the target curve to target a lung carcinoma while "minimiz[ing] dose and avoid[ing] the chest wall sector." *See Exhibit L, pp. 2-3.*

79. That Defendants' Accused Products have infringed the '283 Patent is further supported by information made public as a result of a proceeding before the International Trade Commission titled "In the Matter of Certain Radiotherapy Systems and Treatment Planning Software, and Components Thereof," Investigation No. 337-TA-968 ("the ITC Matter") between complainants Varian Inc. and Varian AG and respondents Elekta AB, Elekta Ltd., Elekta GmbH, Elekta Inc., IMPAC Medical Systems, Inc., Elekta Instrument (Shanghai) Limited, and Elekta Beijing Medical System Co. Ltd. *See Exhibit M.*

80. For example, the Final Initial Determination in the ITC Matter states that "Varian's domestic industry products include the Clinac iX and Trilogy linac systems when used with the On-Board Imager system, and the TrueBeam and Edge linac systems. . . . Varian's linacs are integrated and networked computer-controlled systems used to perform imaging and implement radiotherapy treatments, such as treatment plans generated by Varian's RapidArc VMAT planning software." *Exhibit M, pp. 333-334*.

81. The Final Initial Determination in the ITC Matter further states that "Varian's TrueBeam and Clinac linear accelerators in combination with Varian's Eclipse treatment planning software [are] used to create and deliver RapidArc treatment plans. . . . RapidArc plans are optimized using the Progressive Resolution Optimization (PRO) algorithm," and "[t]wo versions of the PRO algorithm are used in Varian's Domestic Industry Products: PRO2 and PRO3." *Exhibit M, p. 335*.

82. As shown by the Eclipse Treatment Planning Brochure and the Eclipse IMRT Brochure, Eclipse software, which is integrated in the Accused Products, "perform[s] advanced treatment techniques that feature modern optimization and advanced calculation algorithms" on a computer. *See, e.g., Exhibit I, p. 3*.



The user interface updates optimization information with each iteration so the clinician can interactively modify parameters based on real-time feedback.

See Exhibit N, p. 1.

83. The Final Initial Determination in the ITC Matter further states that "[w]hen creating a RapidArc treatment plan, the Eclipse software receives as input a set of one or more optimization goals comprising a desired dose distribution for a patient target volume and surrounding healthy tissue. The goals include maximum and minimum radiation limits for patient target volumes including tumors and surrounding healthy tissue." *Exhibit M, p. 336.*

84. The RapidArc Brochure demonstrates that a RapidArc treatment plan can deliver a prescription dose to a target while maintaining "prescribed limits to surrounding structures." *See Exhibit K, p. 7.*

85. The RapidArc Brochure further states that "RapidArc delivers treatment in one large arc, while avoiding designated areas, by turning off the beam during rotation." *See Exhibit K, p. 8.*

86. The Final Initial Determination in the ITC Matter further states that "[w]hen creating a RapidArc treatment plan, the Eclipse software receives as input a set of one or more

optimization goals comprising a desired dose distribution for a patient target volume and surrounding healthy tissue. The goals include maximum and minimum radiation limits for patient target volumes including tumors and surrounding healthy tissue." *Exhibit M, p. 336.*

87. The Final Initial Determination in ITC Matter also states that Defendants use PRO2/PRO3 algorithms in their products. The PRO algorithms include multiple levels of optimization, each including iterations where simulated dose distribution is optimized, including fluence control points. The algorithms calculate dose distributions and compare to cost functions to move toward convergence. *See Exhibit M, pp. 337-338.*

88. Accordingly, Defendants' Accused Products provide [1] an apparatus, including [2] a computer, for determining an optimized radiation beam arrangement for applying radiation to a tumor target volume while minimizing radiation of a structure volume in a patient and [3] computationally obtaining a proposed radiation beam arrangement by changing beam weights, or equivalents thereof and [4] computationally changing the proposed radiation beam arrangement iteratively, wherein the proposed radiation beam arrangement is changed by changing the beam weights, or equivalents thereof.

89. With regard to [5] incorporating a cost function at each iteration to approach correspondence of partial volume data associated with the proposed radiation beam arrangement to partial volume data associated with a pre-determined desired dose prescription or an equivalent thereof, the Final Initial Determination in the ITC Matter states that Defendants' "software causes the processor to optimize the treatment plan using the PRO algorithm. The PRO algorithm optimizes a simulated dose distribution along treatment trajectory relative to clinical objectives input into the Eclipse software, including the desired dose distribution. The clinical objectives are embodied in a cost function. . . . the PRO algorithm includes multiple

levels of optimization . . . and each . . . level includes a series of iterations where simulated dose distribution is optimized. . . . [T]he PRO algorithm attempts to improve the cost function by adjusting dose amounts and MLC leaf positions at different points along a trajectory." *Exhibit M, pp. 336-337.*

90. As for [6] rejecting the change of the proposed radiation beam arrangement if the change of the proposed radiation beam arrangement leads to a lesser correspondence to the desired dose prescription and accepting the change of the proposed radiation beam arrangement if the change of the proposed radiation beam arrangement leads to a greater correspondence to the desired dose prescription to obtain an optimized radiation beam arrangement or an equivalent thereof, the Final Initial Determination in the ITC Matter states that "[i]n both PRO2 and PRO3, the optimization algorithm calculates a three-dimensional dose distribution and compares it to the cost function to determine whether the iterative adjustments to dose amounts and MLC leaf positions have moved the treatment plan closer to or further away from the clinical objectives. If several adjustments in a row do not lower the cost function by a sufficient amount, the cost function is determined to have converged. If the cost function has converged, or if the algorithm has progressed through a specified number of iterations, then the algorithm moves to the next MR level." *Exhibit M, p. 339.*

91. Upon information and belief, Defendants' past direct infringement of the '283 Patent has irreparably harmed Best.

92. Upon information and belief, Defendants' past direct infringement of the '283 Patent has caused Best damages.

93. As detailed in paragraphs 34-67 above, Defendants' past direct infringement of the '283 Patent was knowing and willful.

COUNT 2: INDIRECT INFRINGEMENT OF THE '283 PATENT BY INDUCEMENT

94. Plaintiff repeats and realleges the allegations set forth in paragraphs 1-93 above as if fully set forth herein.

95. Defendants had knowledge of the '283 Patent and their infringement thereof prior to the filing of the Complaint on October 16, 2018.

96. As detailed above in paragraphs 34 to 67, Defendants had knowledge of the '283 Patent and their infringement thereof by no later than January 26, 2012.

97. Upon information and belief, Defendants are liable for inducing infringement of the '283 Patent under 35 U.S.C. § 271(b) by having knowledge of the '283 Patent prior to the filing of the Complaint in this action on October 16, 2018, as set forth above, and knowingly causing or intending to cause direct infringement of the '283 Patent, with specific intent, by their customers.

98. Despite having knowledge of the '283 Patent, Defendants continued making, using, selling, offering for sale, importing, and/or advertising of Defendants' Accused Products demonstrates that Defendants specifically intended to induce their customers to infringe.

99. Varian provided Eclipse user guides and reference manuals allowing its customers to use the infringing features of Eclipse, including IMRT optimization.

100. Upon information and belief, Defendants actively induced infringement of the '283 Patent by, *inter alia*, training their customers on the use of the Accused Products and/or promotion, sales, and/or importation of the Accused Products to Defendants' customers with knowledge of the '283 Patent and knowledge of infringement.

101. Upon information and belief, Defendants' customers for the Accused Products directly infringed the '283 Patent by, *inter alia*, using the Accused Products.

102. Upon information and belief, Defendants intended to indirectly infringe the ’283 Patent by inducement by having sold the Accused Products for use by Defendants’ customers.

103. As detailed above and further upon information and belief, Defendants knew or should have known of the ’283 Patent and have acted in an egregious and wanton manner by infringing the ’283 Patent.

104. Upon information and belief, despite knowing that their actions constituted induced infringement of the ’283 Patent and/or despite knowing that there was a high likelihood that their actions constituted induced infringement of the ’283 Patent, Defendants nevertheless continued their infringing actions by making, using, offering for sale, and selling the Accused Products.

105. Upon information and belief, Defendants’ past induced infringement of the ’283 Patent has irreparably harmed Best.

106. Upon information and belief, Defendants’ past induced infringement of the ’283 Patent has caused Best damages.

107. Upon information and belief and as detailed in paragraphs 34 to 67 above, Defendants’ past induced infringement of the ’283 Patent was knowing and willful.

COUNT 3: INDIRECT INFRINGEMENT OF THE ’283 PATENT BY CONTRIBUTORY INFRINGEMENT

108. Plaintiff repeats and realleges the allegations set forth in paragraphs 1-107 above as if fully set forth herein.

109. Upon information and belief and as detailed in paragraphs 34 to 67 above, Defendants had knowledge of the ’283 Patent and their infringement thereof by no later than January 26, 2012.

110. Upon information and belief, Defendants are liable for contributory infringement of the ’283 Patent under 35 U.S.C. § 271(c) by, *inter alia*, having sold or offered to sell the Accused Products within the United States and/or by having imported the Accused Products into the United States because the Accused Products constituted a material part of the invention embodied in the ’283 Patent, which, upon information and belief, Defendants knew to be especially made and/or especially adapted for use in infringement of the ’283 Patent, and which were not staple articles or commodities of commerce suitable for substantial non-infringing use.

111. Defendants’ marketing literature and other documents do not propose any non-infringing use for the Accused Products, substantial or otherwise. Rather, the only proposed use for the Accused Products identified in Defendants’ marketing literature and other documents is to eradicate tumors while minimizing damage to healthy tissues and organs surrounding those tumors. As such, the Accused Products are marketed solely for use to eradicate tumors while minimizing damage to healthy tissues and organs surrounding those tumors.

112. The Eclipse treatment planning system is for conformal radiation therapy, IMRT and VMAT therapy and when a treatment plan is created and optimized by Eclipse and is used with a Varian LINAC, that creating of the plan and such use constitutes infringement of the ’283 Patent.

113. Upon information and belief, Defendants are liable for contributory infringement of the ’283 Patent by having had knowledge of the ’283 Patent and knowingly having caused or having intended to cause direct infringement of the ’283 Patent by their customers, including, *e.g.*, end users of the Accused Products.

114. Upon information and belief, Defendants contributed to infringement of the ’283 Patent by, *inter alia*, promotion, sales, and/or importation of the Accused Products to

Defendants' customers, including, *e.g.*, end users who used apparatuses claimed in the '283 Patent and performed methods claimed in the '283 Patent. Upon information and belief, Defendants' customers directly infringed the '283 Patent by, *e.g.*, using the Accused Products.

115. Upon information and belief, Defendants' past contributory infringement of the '283 Patent has irreparably harmed Best.

116. Upon information and belief, Defendants' past contributory infringement of the '283 Patent has caused Best damages.

117. Upon information and belief and as detailed in paragraphs 34 to 67 above, Defendants' past contributory infringement of the '283 Patent has been knowing and willful.

COUNT 4: DIRECT INFRINGEMENT OF THE '096 PATENT

118. Plaintiff repeats and realleges the allegations set forth in paragraphs 1-117 above as if fully set forth herein.

119. This cause of action arises under the patent laws of the United States, including 35 U.S.C. §§ 271 *et seq*.

120. The '096 Patent was duly and lawfully issued by the USPTO on May 21, 2002, to listed co-inventors Mark P. Carol, Robert Hill, Bruce Curran, and Richard V. Nash. *See Exhibit B, Cover*.

121. Plaintiff is the owner by assignment of all right, title, and interest in and to the '096 Patent. Evidence of the assignment of the '096 Patent from co-inventors Carol, Hill, and Nash to Nomos Corporation is recorded at the USPTO at Reel 012973, Frame 0698, from co-inventor Curran to Nomos Corporation at Reel 012973, Frame 0694, and from Nomos Corporation to Plaintiff at Reel 020062, Frame 0709.

122. The '096 Patent is titled "Planning Method and Apparatus for Radiation

Dosimetry." *See Exhibit B, Cover*.

123. The '096 Patent is directed to, *inter alia*, methods and apparatuses for determining an optimized radiation beam arrangement for applying radiation to a tumor target volume while minimizing radiation of a structure volume in a patient. *See Exhibit B, Abstract*. One of the [1] apparatuses for determining an optimized radiation beam arrangement for applying radiation to a tumor target volume while minimizing radiation of a structure volume in a patient claimed in the '096 Patent comprises [2] a computer adapted to [3] computationally obtain a proposed radiation beam arrangement, [4] computationally change the proposed radiation beam arrangement iteratively to conform to a target CDVH curve, [5] incorporate a cost function at each iteration to approach correspondence of partial volume data associated with the proposed radiation beam arrangement to partial volume data associated with a predetermined desired dose prescription, [6] reject the change of the proposed radiation beam arrangement if the change of the proposed radiation beam arrangement leads to a lesser correspondence to the desired dose prescription and to accept the change of the proposed radiation beam arrangement if the change of the proposed radiation beam arrangement leads to a greater correspondence to the desired dose prescription to obtain an optimized radiation beam arrangement, and [7] exceed the cost function by a set amount if such excess allows better conformation with the target CDVH curve. *See Exhibit B, Claim 31*.

124. As detailed in paragraphs 34 to 67 above, Defendants had knowledge of the '096 Patent and their infringement thereof by no later than January 26, 2012.

125. Upon information and belief, each of the Defendants has been and is now directly infringing, literally and/or under the doctrine of equivalents, under 35 U.S.C. § 271(a), one or more claims of the '096 Patent, including at least Claims 18, 21, 23, 31-33, 40, and 43-46 of the

'096 Patent, by making, using, selling, offering for sale, importing, and/or advertising in the United States at least Defendants' Clinac® linear accelerator (*see Exhibit E*), Clinac® iX linear accelerator (*see Exhibit R*), VitalBeam® Radiotherapy System (*see Exhibit F*), Trilogy® System (*see Exhibit G*), TrueBeam® Radiotherapy System (*see Exhibit H*), and Halcyon™ Radiotherapy System (*see Exhibit Q*), in conjunction with at least Defendants' Eclipse™ Treatment Planning System (*see Exhibit I*) and/or Defendants' RapidPlan™ Knowledge-Based Planning System (*see Exhibit J*) and/or Defendants' RapidArc® Planning System (*see Exhibit K*).

126. Upon information and belief, Defendants' linear accelerators, including the Clinac® linear accelerator, Clinac® iX linear accelerator, VitalBeam® Radiotherapy System, Trilogy® System, TrueBeam® Radiotherapy System, and Halcyon™ Radiotherapy System, in conjunction with at least Defendants' Eclipse™ Treatment Planning System and/or Defendants' RapidPlan™ Knowledge-Based Planning System and/or Defendants' RapidArc® Planning System, provide apparatuses as set forth in at least Claims 31-33 of the '096 Patent.

127. Upon information and belief, Defendants' Clinac® linear accelerator system is [1] an apparatus for determining an optimized radiation beam arrangement for applying radiation to a tumor target volume while minimizing radiation of a structure volume in a patient. As noted in their brochure, the Clinac® linear accelerator system allows their users to "quickly deliver a wide range of radiation therapy to your patients including Intensity Modulated Radiotherapy (IMRT), Image-Guided Radiotherapy (IGRT), Volumetric Modulated Arc Therapy (VMAT), RapidArc® and stereotactic radiosurgery" which gives "the flexibility to shape the beam while controlling the dose rate and the gantry speed for a highly conformed dose." *See Exhibit E, pp. 4, 7.* The system allows one to "quickly and accurately deliver powerful treatments . . . while reducing the risk to surrounding healthy tissue." *See Exhibit E, p. 7.*

128. Upon information and belief, Defendants' Clinac® linear accelerator system includes a [2] computer that [3] obtains a proposed radiation beam arrangement and [4] computationally changes the proposed arrangement to conform to a target CDVH curve by [5] incorporating a cost function and [6] rejecting changes if there is lesser correspondence and accepting changes if there is greater correspondence and [7] exceeding the cost function if better conformation with the target CDVH curve is obtained. As noted in their brochure, the Clinac® linear accelerator system keeps "the treatment process connected through integration with treatment planning and information management software." *See Exhibit E, p. 4.* As noted in a Clinac® case study, Defendants' RapidArc® Planning System can be used to create an "[i]mage-guided dosimetric assessment," obtain proposed radiation beam arrangements, verify positioning, and select the plan with greater conformation with the target curve to target a lung carcinoma while "minimiz[ing] dose and avoid[ing] the chest wall sector." *See Exhibit L, pp. 2-3.*

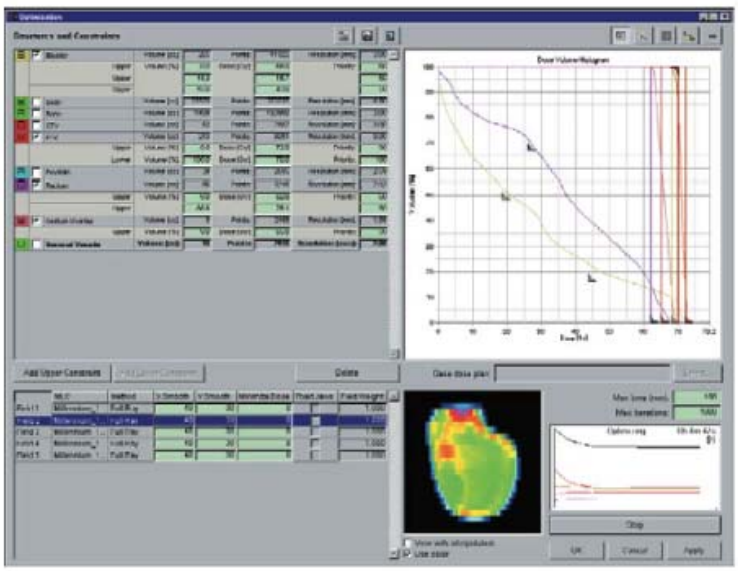
129. That Defendants' Accused Products have infringed the '096 Patent is further supported by information made public as a result of the ITC Matter. *See Exhibit M.*

130. For example, the Final Initial Determination in the ITC Matter states that "Varian's domestic industry products include the Clinac iX and Trilogy linac systems when used with the On-Board Imager system, and the TrueBeam and Edge linac systems. . . . Varian's linacs are integrated and networked computer-controlled systems used to perform imaging and implement radiotherapy treatments, such as treatment plans generated by Varian's RapidArc VMAT planning software." *Exhibit M, pp. 333-334.*

131. The Final Initial Determination in the ITC Matter further states that "Varian's TrueBeam and Clinac linear accelerators in combination with Varian's Eclipse treatment planning software [are] used to create and deliver RapidArc treatment plans. . . . RapidArc

plans are optimized using the Progressive Resolution Optimization (PRO) algorithm," and "[t]wo versions of the PRO algorithm are used in Varian's Domestic Industry Products: PRO2 and PRO3." *Exhibit M, p. 335*.

132. As shown by the Eclipse Treatment Planning Brochure and the Eclipse IMRT Brochure, Eclipse software, which is integrated in the Accused Products, "performs advanced treatment techniques that feature modern optimization and advanced calculation algorithms" on a computer. *See Exhibit I, p. 3.*



The user interface updates optimization information with each iteration so the clinician can interactively modify parameters based on real-time feedback.

See Exhibit N, p. 1.

133. The Final Initial Determination in the ITC Matter further states that "[w]hen creating a RapidArc treatment plan, the Eclipse software receives as input a set of one or more optimization goals comprising a desired dose distribution for a patient target volume and surrounding healthy tissue. The goals include maximum and minimum radiation limits for patient target volumes including tumors and surrounding healthy tissue." *Exhibit M, p. 336*.

134. The RapidArc Brochure demonstrates that a RapidArc treatment plan can deliver

a prescription dose to a target while maintaining "prescribed limits to surrounding structures." *See Exhibit K, p. 7*.

135. The RapidArc Brochure further states that "RapidArc delivers treatment in one large arc, while avoiding designated areas, by turning off the beam during rotation." *See Exhibit K, p. 8*.

136. The Final Initial Determination in the ITC Matter further states that "[w]hen creating a RapidArc treatment plan, the Eclipse software receives as input a set of one or more optimization goals comprising a desired dose distribution for a patient target volume and surrounding healthy tissue. The goals include maximum and minimum radiation limits for patient target volumes including tumors and surrounding healthy tissue." *Exhibit M, p. 336.*

137. The Final Initial Determination in ITC Matter also states that Defendants use PRO2/PRO3 algorithms in their products. The PRO algorithms include multiple levels of optimization, each including iterations where simulated dose distribution is optimized, including fluence control points. The algorithms calculate dose distributions and compare to cost functions to move toward convergence. *See Exhibit M, pp. 337-338.*

138. Accordingly, Defendants' Accused Products provide [1] an apparatus, including [2] a computer, for determining an optimized radiation beam arrangement for applying radiation to a tumor target volume while minimizing radiation of a structure volume in a patient and [3] computationally obtaining a proposed radiation beam arrangement, or equivalents thereof.

139. As for [4] computationally changing the proposed radiation beam arrangement iteratively to conform to a target CDVH curve, the Final Initial Determination in the ITC Matter states that "[w]hen creating a RapidArc treatment plan, the Eclipse software receives as input a set of one or more optimization goals comprising a desired dose distribution for a patient target

volume and surrounding healthy tissue. The goals include maximum and minimum radiation limits for patient target volumes including tumors and surrounding healthy tissue." *Exhibit M, p. 336.*

140. Defendants' Eclipse Photon and Electron Algorithms Reference Guide provides that the system's optimization is based on dose-volume objectives. *See Exhibit O, p. 179.*

141. Defendants' Eclipse system evaluates dose volume histogram ("DVH") for structures and calculates DVH during optimization. *See Exhibit O, pp. 177, 187, 188, 192.*

142. The Final Initial Determination in the ITC Matter states that "Varian's domestic Industry Products practice claims 26 and 41 of [U.S. Patent No. 8,696,538 (*Exhibit P*) ("the '538 patent")] . . . the Domestic Industry Products for the '538 patent include Varian's TrueBeam and Clinac linear accelerators in combination with Varian's Eclipse treatment planning software that is used to create and deliver RapidArc treatment plans. *Exhibit M, p. 335.*

143. Claim 23 of the '538 patent, from which referenced Claim 26 depends, reads:

> A method for planning delivery of radiation dose to a target region within a subject, the method comprising: iteratively optimizing, by a processor, a simulated dose distribution relative to a set of one or more optimization goals **comprising a desired dose distribution in the subject** over an initial plurality of control points . . . **iteratively optimizing, by the processor, a simulated dose distribution relative to the set of one or more optimization goals over the increased plurality of control points to thereby determine a radiation delivery plan . . . wherein iteratively optimizing**, by the processor, the simulated dose distribution relative to the set of one or more optimization goals over the initial plurality of control points **comprises performing, by the processor, the iterative optimization using a set of optimization parameters, the set of optimization parameters representative of one or more of: a beam shape of the radiation source, and a beam intensity of the radiation source.**

Exhibit P, col. 34, ll. 35-65 (emphasis added).

144. Figures 12A-12F of the '538 patent graphically depict simulated dose distribution calculation at various stages of the optimization process by way of a DVH. *See, e.g.*, *Exhibit P,*

col. 25, ll. 15-51 (showing increase of control points and iterations during optimization process, the iterations and control point increase providing "dramatic improvement in dose quality" by reducing dose to critical structure).

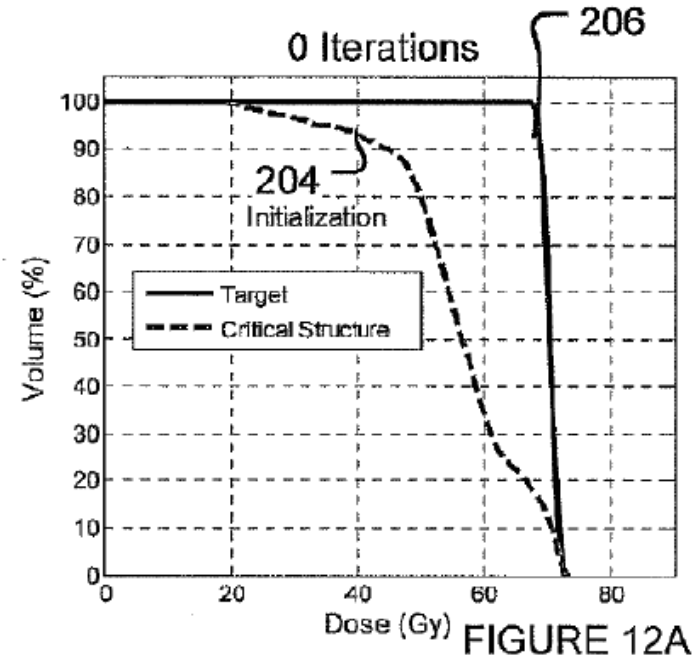


FIGURE 12A

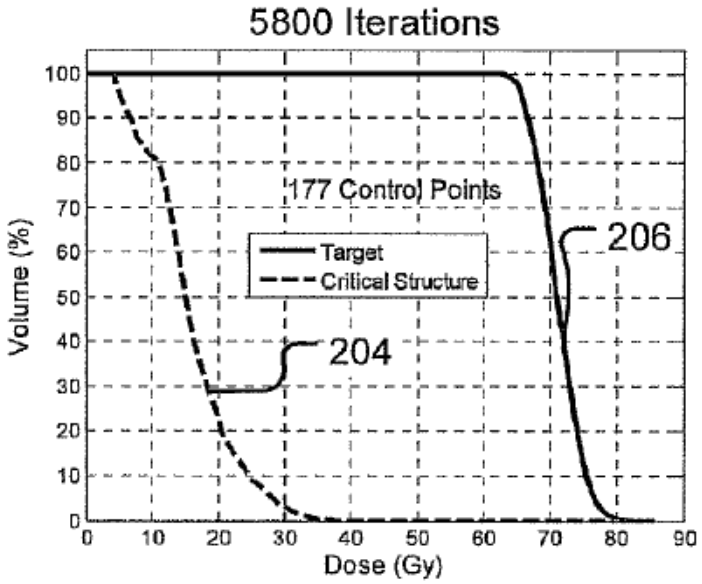


FIGURE 12E

Exhibit P, Figures 12A, 12E.

145. Accordingly, Defendants' Accused Products comprise a computer which is adapted to [4] computationally change the proposed radiation beam arrangement iteratively to conform to a target CDVH curve, or equivalent thereof.

146. With regard to [5] incorporating a cost function at each iteration to approach correspondence of partial volume data associated with the proposed radiation beam arrangement to partial volume data associated with a predetermined desired dose prescription or an equivalent thereof, the Final Initial Determination in the ITC Matter states that Defendants' "software causes the processor to optimize the treatment plan using the PRO algorithm. The PRO algorithm optimizes a simulated dose distribution along treatment trajectory relative to clinical objectives input into the Eclipse software, including the desired dose distribution. The clinical objectives are embodied in a cost function. . . . [T]he PRO algorithm includes multiple levels of optimization . . . and each . . . level includes a series of iterations where simulated dose distribution is optimized. . . . [T]he PRO algorithm attempts to improve the cost function by adjusting dose amounts and MLC leaf positions at different points along a trajectory." *Exhibit M, pp. 336-337.*

147. As for [6] rejecting the change of the proposed radiation beam arrangement if the change of the proposed radiation beam arrangement leads to a lesser correspondence to the desired dose prescription and to accept the change of the proposed radiation beam arrangement if the change of the proposed radiation beam arrangement leads to a greater correspondence to the desired dose prescription to obtain an optimized radiation beam arrangement or an equivalent thereof, the Final Initial Determination in the ITC Matter states that "[i]n both PRO2 and PRO3, the optimization algorithm calculates a three-dimensional dose distribution and compares it to

the cost function to determine whether the iterative adjustments to dose amounts and MLC leaf positions have moved the treatment plan closer to or further away from the clinical objectives. If several adjustments in a row do not lower the cost function by a sufficient amount, the cost function is determined to have converged. If the cost function has converged, or if the algorithm has progressed through a specified number of iterations, then the algorithm moves to the next MR level. *Exhibit M, p. 339.*

148. Defendants' Eclipse Photon and Electron Algorithms Reference Guide recites the following:

> **The optimization is based on dose-volume objectives (upper and lower objectives defined in the Dose Volume Histogram view inside the Optimization dialog).** Dose-volume objectives are used to define the dose as follows:
> *Upper objective*: Used to limit the dose in a given structure (for example, "no more than 20% of the structure may receive more than 25 Gy").
> *Lower objective*: Used to define desired dose levels in target structures (for example, "at least 70% of the structure must receive at least 20 Gy").
> *Upper line objective*: Used to limit the dose in a given structure for all volume levels.
> **If the dose-volume objectives are not met, a weighted quadratic cost is added to the total objective function. For the upper objective, the cost is applied for the portion of doses that exceed the desired dose value and volume level.** For the lower objective, the cost is applied for the portion of doses that fall short of the desired dose value and volume level.

See Exhibit O, pp. 179-180 (emphasis added).

149. Accordingly, Defendants' Accused Products comprise a computer which is adapted to [7] exceed the cost function by a set amount if such excess allows better conformation with the target CDHV curve, or equivalent thereof.

150. Upon information and belief, Defendants' past direct infringement of the '096 Patent has irreparably harmed Best.

151. Upon information and belief, Defendants' past direct infringement of the '096

Patent has caused Best damages.

152. Upon information and belief and as detailed in paragraphs 34 to 67 above, Defendants' past direct infringement of the '096 Patent has been knowing and willful.

153. Upon information and belief, Defendants' actions have caused Best to suffer irreparable harm resulting from the abuse of its patent rights, including the ability to exclude others from the market.

COUNT 5: INDIRECT INFRINGEMENT OF THE '096 PATENT BY INDUCEMENT

154. Plaintiff repeats and realleges the allegations set forth in paragraphs 1-153 above as if fully set forth herein.

155. Defendants have been aware of the '096 patent since at least the filing of the Complaint in this action on October 16, 2018, yet continued their own infringing activity as well as their inducement of infringement by their customers through the expiration of the term of the '096 Patent.

156. The Complaint in this action, filed on October 16, 2018, provided Defendants with knowledge of the '096 patent.

157. The Complaint in this action, filed on October 16, 2018, also provided Defendants with knowledge of infringement caused by using, making, using, selling, offering for sale, importing, and/or advertising in the United States of Defendants' Accused Products.

158. Defendants' continued making, using, selling, offering for sale, importing, and/or advertising of Defendants' Accused Products demonstrates that Defendants specifically intend to induce their customers to infringe.

159. Defendants had knowledge of the '096 Patent and their infringement thereof prior to the filing of the Complaint on October 16, 2018.

160. As detailed above in paragraphs 34 to 67, Defendants had knowledge of the ’096 Patent and their infringement thereof by no later than January 26, 2012.

161. Upon information and belief, Defendants are liable for inducing infringement of the ’096 Patent under 35 U.S.C. § 271(b) by having knowledge of the ’096 Patent prior to the filing of the Complaint in this action on October 16, 2018, as set forth above, and knowingly causing or intending to cause, and continuing to knowingly cause or intend to cause, direct infringement of the ’096 Patent, with specific intent, by their customers.

162. Defendants’ continued making, using, selling, offering for sale, and/or importing of Defendants’ Accused Products despite having knowledge of the ’096 Patent demonstrates that Defendants specifically intended to induce their customers to infringe.

163. Upon information and belief, Defendants actively induced infringement of the ’096 Patent by, *inter alia*, training their customers on the use of the Accused Products and/or promotion, sales, and/or importation of the Accused Products to Defendants’ customers.

164. Upon information and belief, Defendants’ customers for the Accused Products directly infringed the ’096 Patent by, *inter alia*, using the Accused Products.

165. Upon information and belief, Defendants intended to indirectly infringe the ’096 Patent by inducement by selling the Accused Products for use by Defendants’ customers.

166. Upon information and belief and as detailed in paragraphs 34 to 67 above, Defendants knew or should have known of the ’096 Patent and have acted in an egregious and wanton manner by infringing the ’096 Patent.

167. Upon information and belief, despite knowing that their actions constituted induced infringement of the ’096 Patent and/or despite knowing that there was a high likelihood that their actions constituted induced infringement of the ’096 Patent, Defendants nevertheless

continued their infringing actions, and continued to make, use, offer for sale, and sell the Accused Products.

168. Upon information and belief, Defendants' acts of infringement of the '096 Patent have irreparably harmed Best.

169. Upon information and belief, Defendants' past induced infringement of the '096 Patent has caused Best damages.

170. Upon information and belief and as detailed in paragraphs 34 to 67 above, Defendants' past induced infringement of the '096 Patent has been knowing and willful.

171. Upon information and belief, Defendants' actions have caused Best to suffer irreparable harm resulting from the abuse of its lawful patent rights, including the ability to exclude others from the market.

COUNT 6: INDIRECT INFRINGEMENT OF THE '096 PATENT BY CONTRIBUTORY INFRINGEMENT

172. Plaintiff repeats and realleges the allegations set forth in paragraphs 1-171 above as if fully set forth herein.

173. As detailed above in paragraphs 34 to 67, Defendants had knowledge of the '096 Patent and their infringement thereof by no later than January 26, 2012.

174. Upon information and belief, Defendants are liable for contributory infringement of the '096 Patent under 35 U.S.C. § 271(c) by, *inter alia*, having sold or offered to sell, the Accused Products within the United States and/or by importing the Accused Products into the United States because the Accused Products constitute a material part of the invention embodied in the '096 Patent, which, upon information and belief, Defendants knew to be especially made and/or especially adapted for use in infringement of the '096 Patent, and which were not staple

articles or commodities of commerce suitable for substantial non-infringing use.

175. Defendants' marketing literature and other documents do not propose any non-infringing use for the Accused Products, substantial or otherwise. Rather, the only proposed use for the Accused Products identified in Defendants' marketing literature and other documents is to eradicate tumors while minimizing damage to healthy tissues and organs surrounding those tumors. As such, the Accused Products are marketed solely for use to eradicate tumors while minimizing damage to healthy tissues and organs surrounding those tumors.

176. The Eclipse treatment planning system is for conformal radiation therapy, IMRT and VMAT therapy and when a treatment plan is created and optimized by Eclipse and is used with a Varian LINAC, that creating of the plan and such use constitutes infringement of the '096 Patent.

177. Upon information and belief, Defendants are liable for contributory infringement of the '096 Patent by having knowledge of the '096 Patent and knowingly causing or intending to cause, direct infringement of the '096 Patent by their customers, including, *e.g.*, end users of the Accused Products.

178. Upon information and belief, Defendants contribute to infringement of the '096 Patent by, *inter alia*, promotion, sales, and/or importation of the Accused Products to Defendants' customers, including, *e.g.*, end users who used apparatuses claimed in the '096 Patent and performed methods claimed in the '096 Patent. Upon information and belief, Defendants' customers directly infringed the '096 Patent by, *e.g.*, using the Accused Products.

179. Upon information and belief, Defendants' past contributory infringement of the '096 Patent has irreparably harmed Best.

180. Upon information and belief, Defendants' past contributory infringement of the

'096 Patent has caused Best damages.

181. At least in view of Defendants' prior business dealings and prior communications with Best as detailed in paragraphs 34 to 67 above, Defendants' past contributory infringement of the '096 Patent had been knowing and willful.

182. Upon information and belief, Defendants' actions have caused Best to suffer irreparable harm resulting from the abuse of its lawful patent rights, including the ability to exclude others from the market.

COUNT 7: DIRECT INFRINGEMENT OF THE '175 PATENT

183. Plaintiff repeats and realleges the allegations set forth in paragraphs 1-182 above as if fully set forth herein.

184. This cause of action arises under the patent laws of the United States, including 35 U.S.C. §§ 271 *et seq.*

185. The '175 Patent was duly and lawfully issued by the USPTO on September 4, 2007, to listed inventor Merle Romesberg. *See Exhibit C, Cover.*

186. Plaintiff is the owner by assignment of all right, title, and interest in and to the '175 Patent. Evidence of the assignment of the '175 Patent from inventors Romesberg to Nomos Corporation is recorded at the USPTO at Reel 016920, Frame 0083 and from Nomos Corporation to Plaintiff at Reel 020062, Frame 0709.

187. The '175 Patent is titled "Planning Method for Radiation Therapy." *See Exhibit C, Cover.*

188. The '175 Patent is directed to, *inter alia*, methods for controlling the correlation between the factors of treatment plan efficiency and dosimetric fitness to optimize the radiation therapy or radiotherapy plan. *See Exhibit C, Abstract.* One of the methods [1] of providing

control of a trade-off between treatment plan delivery efficiency and dosimetric fitness to optimize a radiation treatment plan within a continuum between delivery efficiency and dosimetric fitness claimed in the '175 Patent comprises the steps of [2] assigning a delivery cost term within an optimizer to each of a plurality of intensity maps representing a potential radiation beam arrangement, the assignment based on complexity of each respective intensity map; and [3] evaluating an objective cost function for each of the plurality of intensity maps, the objective function including a dosimetric cost term and the delivery cost term, the dosimetric cost term representing dosimetric fitness of the respective intensity map and the delivery cost term representing delivery efficiency. *See Exhibit C, Claim 13*.

189. As detailed above in paragraphs 34 to 67, Defendants had knowledge of the '175 Patent and their infringement thereof by no later than January 26, 2012.

190. Upon information and belief, each of the Defendants has been and is now directly infringing, literally and/or under the doctrine of equivalents, under 35 U.S.C. § 271(a), one or more claims of the '175 Patent, including at least Claims 13-16 and 19 of the '175 Patent, by using at least Defendants' Clinac® linear accelerator (*see Exhibit E*), Clinac® iX linear accelerator (*see Exhibit R*), VitalBeam® Radiotherapy System (*see Exhibit F*), Trilogy® System (*see Exhibit G*), TrueBeam® Radiotherapy System (*see Exhibit H*), and Halcyon™ Radiotherapy System (*see Exhibit Q*), in conjunction with at least Defendants' Eclipse™ Treatment Planning System (*see Exhibit I*) and/or Defendants' RapidPlan™ Knowledge-Based Planning System (*see Exhibit J*) and/or Defendants' RapidArc® Planning System (*see Exhibit K*) in the United States.

191. Upon information and belief, Defendants' linear accelerators, including the Clinac® linear accelerator, Clinac® iX linear accelerator, VitalBeam® Radiotherapy System, Trilogy® System, and TrueBeam® Radiotherapy System, in conjunction with at least Defendants'

Eclipse™ Treatment Planning System and/or Defendants' RapidPlan™ Knowledge-Based Planning System and/or Defendants' RapidArc® Planning System, practice methods as set forth in at least Claims 13-16 and 19 of the '175 Patent.

192. For example, Defendants' RapidArc® Planning System is "radiotherapy technology [that] makes it possible to deliver integrated and personalized treatments with speed and precision. Integrate it with the Eclipse™ treatment planning system and create sophisticated plans based on automated suggestions and other intelligent features . . . RapidArc represents a chance to introduce new efficiencies into the entire treatment process for a variety of delivery platforms – including the Clinac® iX linear accelerator, the Trilogy® system and the TrueBeam™ system." *See Exhibit K, p. 3.*

193. Defendants' RapidArc® Planning System "is a volumetric arc therapy that delivers a precisely sculpted dose distribution. Treatments can be delivered in single, multiple and non-coplanar arc segments, depending on the clinical case. The optimization algorithm of RapidArc adjusts not only the treatment aperture, but also the rotational speed of the gantry and the delivery dose rate. These adjustments work to maximize tumor control while minimizing dose to surrounding healthy tissue." *Exhibit K, p. 6.*

194. Upon information and belief, Defendants' RapidArc® Planning System "[i]mprove[s] optimization results and reduce[s] time spent on treatment planning," thereby offering methods [1] of providing control of a trade-off between treatment plan delivery efficiency and dosimetric fitness to optimize a radiation treatment plan within a continuum between delivery efficiency and dosimetric fitness. *See Exhibit K, p. 8.* Defendants' RapidArc® Planning System also "suggests an optimal arc placement, taking into account tumor size and location, as well as specific accelerator parameters" by [2] assigning a delivery cost term within

an optimizer to each of a plurality of intensity maps representing a potential radiation beam arrangement, the assignment based on complexity of each respective intensity map; and [3] evaluating an objective cost function for each of the plurality of intensity maps, the objective function including a dosimetric cost term and the delivery cost term, the dosimetric cost term representing dosimetric fitness of the respective intensity map and the delivery cost term representing delivery efficiency. *See Exhibit K, p. 8.*

195. That Defendants' Accused Products have infringed the '175 Patent is further supported by information made public as a result of the ITC Matter. *See Exhibit M.*

196. For example, the Final Initial Determination in the ITC Matter states that "RapidArc is a VMAT treatment technology sold by Varian. It includes both treatment planning and treatment delivery components. For treatment planning, it consists of optimization algorithms used within Eclipse for developing VMAT treatment plans. For treatment delivery, it consists of hardware modifications to TrueBeam (including Edge) and Clinac (including Clinac iX and Trilogy) treatment delivery platforms to enable delivery of VMAT treatment plans." *See Exhibit M, p. 268*.

197. RapidArc treatment plans use the PRO [Progressive Resolution Optimizer] algorithm to optimize the dose distribution delivered to the patient target volume. *See Exhibit M, p. 336*.

198. The Final Initial Determination in the ITC Matter further states that Varian's Eclipse treatment planning system causes the computer processor to optimize a treatment plan using the PRO algorithm:

> The PRO algorithm **optimizes a simulated dose distribution along the treatment trajectory relative to the clinical objectives input into the Eclipse software, including the desired dose distribution. The clinical objectives are embodied in a cost function.** The PRO algorithm [for

> example] includes multiple levels of optimization, called MR levels, and each MR level includes a series of iterations where the simulated dose distribution is optimized**. At each iteration, the PRO algorithm attempts to improve the cost function by adjusting dose amounts and MLC leaf positions at different points along the trajectory**.

Exhibit M, pp. 336-337 (emphasis added).

199. Defendants' Eclipse Photon and Electron Algorithms Reference states that in the Eclipse treatment planning system:

> **[t]he MU [Monitor Units] objective can be used to control the number of MU that the PO [Photon Optimization] or PRO optimizer produces.** Minimum and maximum values can be defined. An extra multiplier is applied to the total objective function value if the number of MU is not in the desired range, Strength value can be used to modify the strength of the effect. Because the value is a multiplier to total objective function value, the relative effect of the MU objective remains the same even when the priorities of the dose-volume objectives are changed.

Exhibit O, p. 181 (emphasis added).

200. From the foregoing, Defendants' Accused Products practice a method [1] of providing control of a trade-off between treatment plan delivery efficiency and dosimetric fitness to optimize a radiation treatment plan within a continuum between delivery efficiency and dosimetric fitness to optimize a radiation treatment plan within a continuum between delivery efficiency and dosimetric fitness, or equivalent thereof.

201. With regard to [2] assigning a delivery cost term within an optimizer to each of a plurality of intensity maps representing a potential radiation beam arrangement, the assignment based on complexity of each respective intensity map, the Final Initial Determination in the ITC Matter further states that Varian's Eclipse software causes the computer processor to optimize a treatment plan using the PRO algorithm:

> The PRO algorithm **optimizes a simulated dose distribution along the treatment trajectory relative to the clinical objectives input into the Eclipse software, including the desired dose distribution. The clinical objectives are embodied in a cost function.** The PRO algorithm [for

> example] includes multiple levels of optimization, called MR levels, and each MR level includes a series of iterations where the simulated dose distribution is optimized**. At each iteration, the PRO algorithm attempts to improve the cost function by adjusting dose amounts and MLC leaf positions at different points along the trajectory**.

Exhibit M, pp. 336-337 (emphasis added).

202. Defendants' Eclipse Reference Guide states that:

> **Eclipse IMRT is capable of creating highly conformal dose distributions by optimizing the beam intensity modulation from user- defined dose volume objectives.** The algorithm used in Eclipse IMRT, Dose Volume Optimizer (DVO), **determines the optimal field shape and intensity by iteratively conforming the dose distribution to the desired objectives until an optimum solution is reached**.

Exhibit O, p. 194 (emphasis added).

203. Defendants' Eclipse IMRT Brochure states that "[p]owerful 3D conformal planning tools in Eclipse are combined with interactive dose-volume optimization for fast, flexible, and accurate intensity-modulated radiation therapy (IMRT) planning . . . While the plan evolves, the clinician can see real-time updates to the dose-volume histogram (DVH), objective function, and fluence matrices. . . . DVH curves displayed during optimization match the results for the final dose calculation." *See Exhibit N, pp. 1-2.*

204. Thus, Defendants' Accused Products practice a method including the step of [2] assigning a delivery cost term within an optimizer to each of a plurality of intensity maps representing a potential radiation beam arrangement, the assignment based on complexity of each respective intensity map, or an equivalent thereof.

205. The Eclipse Photon and Electron Algorithms Reference states that "[t]he algorithm used in Eclipse IMRT, Dose Volume Optimizer (DVO), determines the optimal field shape and intensity by iteratively conforming the dose distribution to the desired objectives until an optimum solution is reached." *See Exhibit O, p. 194.*

206. Thus, Defendants' Accused Products practice a method including the step of [3] evaluating an objective cost function for each of the plurality of intensity maps, the objective function including a dosimetric cost term and the delivery cost term, the dosimetric cost term representing dosimetric fitness of the respective intensity map and the delivery cost term representing delivery efficiency, or an equivalent thereof.

207. Upon information and belief, Defendants' past and ongoing direct infringement of the '175 Patent has and will continue to irreparably harm Best.

208. Upon information and belief, Defendants' past and ongoing direct infringement of the '175 Patent has and will cause Best damages.

209. Upon information and belief and as detailed in paragraphs 34 to 67 above, Defendants' past and ongoing direct infringement of the '175 Patent has been knowing and willful.

210. Upon information and belief, Defendants' actions have caused Best to suffer irreparable harm resulting from the abuse of its patent rights, including the ability to exclude others from the market. Upon information and belief, Defendants will continue these infringing acts unless enjoined by this court.

COUNT 8: INDIRECT INFRINGEMENT OF THE '175 PATENT BY INDUCEMENT

211. Plaintiff repeats and realleges the allegations set forth in paragraphs 1-210 above as if fully set forth herein.

212. Defendants have been aware of the '175 patent since at least the filing of the Complaint in this action on October 16, 2018, yet continue their own infringing activity as well as their inducement of infringement by their customers.

213. The Complaint in this action, filed on October 16, 2018, provided Defendants

with knowledge of the ’175 patent.

214. The Complaint in this action, filed on October 16, 2018, also provided Defendants with knowledge of infringement caused by Defendants’ customers using Defendants’ Accused Products in the United States.

215. Defendants’ continued training of their customers to use Defendants’ Accused Products demonstrates that Defendants specifically intend to induce their customers to infringe.

216. As detailed in paragraphs 34 to 67 above, Defendants had knowledge of the ’175 Patent and their infringement thereof prior to the filing of the Complaint on October 16, 2018.

217. Upon information and belief, Defendants are liable for inducing infringement of the ’175 Patent under 35 U.S.C. § 271(b) by having knowledge of the ’175 Patent prior to the filing of the Complaint in this action on October 16, 2018, as set forth above, and knowingly causing or intending to cause, and continuing to knowingly cause or intend to cause, direct infringement of the ’175 Patent, with specific intent, by their customers.

218. Upon information and belief, Defendants actively induce infringement of the ’175 Patent by, *inter alia*, training their customers on the Accused Products that perform methods claimed in the ’175 Patent.

219. Defendants’ continued training of customers to use Defendants’ Accused Products demonstrates that Defendants specifically intend to induce their customers to infringe.

220. Upon information and belief, Defendants’ customers for the Accused Products directly infringe the ’175 Patent by, *inter alia*, using the Accused Products.

221. Upon information and belief, Defendants intend to, and continue to intend to, indirectly infringe the ’175 Patent by inducement by selling the Accused Products for use by Defendants’ customers.

222. Upon information and belief, Defendants knew or should have known of the ’175 Patent and have acted, and continue to act, in an egregious and wanton manner by infringing the ’175 Patent.

223. Upon information and belief, despite knowing that their actions constituted induced infringement of the ’175 Patent and/or despite knowing that there was a high likelihood that their actions constituted induced infringement of the ’175 Patent, Defendants nevertheless continue their infringing actions, and continue to make, use, offer for sale, and sell the Accused Products to enable their customers to infringe the claimed methods.

224. Upon information and belief, Defendants’ acts of infringement of the ’175 Patent have and will continue to irreparably harm Best.

225. Upon information and belief, Defendants’ past and ongoing induced infringement of the ’175 Patent has and will cause Best damages.

226. As detailed in paragraphs 34 to 67 above, Defendants’ past and ongoing induced infringement of the ’175 Patent has been knowing and willful.

227. Upon information and belief, Defendants’ actions have caused Best to suffer irreparable harm resulting from the abuse of its lawful patent rights, including the ability to exclude others from the market. Upon information and belief, Defendants will continue these infringing acts unless enjoined by this court.

COUNT 9: INDIRECT INFRINGEMENT OF THE ’175 PATENT BY CONTRIBUTORY INFRINGEMENT

228. Plaintiff repeats and realleges the allegations set forth in paragraphs 1-227 above as if fully set forth herein.

229. As detailed above in paragraphs 34 to 67, Defendants had knowledge of the ’175

Patent and their infringement thereof by no later than January 26, 2012.

230. Upon information and belief, Defendants are liable for contributory infringement of the ’175 Patent under 35 U.S.C. § 271(c) by, *inter alia*, having sold or offered to sell, and continuing to sell or offer to sell, the Accused Products within the United States and/or by importing the Accused Products into the United States because the Accused Products constitute a material part of the invention embodied in the ’175 Patent, which, upon information and belief, Defendants know to be especially made and/or especially adapted for use in infringement of the ’175 Patent, and which are not staple articles or commodities of commerce suitable for substantial non-infringing use.

231. Defendants’ marketing literature and other documents do not propose any non-infringing use for the Accused Products, substantial or otherwise. Rather, the only proposed use for the Accused Products identified in Defendants’ marketing literature and other documents is to eradicate tumors while minimizing damage to healthy tissues and organs surrounding those tumors. As such, the Accused Products are marketed solely for use to eradicate tumors while minimizing damage to healthy tissues and organs surrounding those tumors.

232. The Eclipse treatment planning system is for conformal radiation therapy, IMRT and VMAT therapy and when a treatment plan is created and optimized by Eclipse and is used with a Varian LINAC, that creating of the plan and such use constitutes infringement of the ‘175 Patent.

233. Upon information and belief, Defendants are liable for contributory infringement of the ’175 Patent by having knowledge of the ’175 Patent and knowingly causing or intending to cause, and continuing to knowingly cause or intend to cause, direct infringement of the ’175 Patent by their customers, including, *e.g.*, end users of the Accused Products.

234. Upon information and belief, Defendants contribute to infringement of the '175 Patent by, *inter alia*, promotion, sales, and/or importation of the Accused Products to Defendants' customers, including, *e.g.*, end users who perform methods claimed in the '175 Patent. Upon information and belief, Defendants' customers directly infringe the '175 Patent by, *e.g.*, using the Accused Products.

235. Upon information and belief, Defendants' past and ongoing contributory infringement of the '175 Patent has and will continue to irreparably harm Best.

236. Upon information and belief, Defendants' past and ongoing contributory infringement of the '175 Patent has and will cause Best damages.

237. As detailed above in paragraphs 34 to 67, Defendants' past and ongoing contributory infringement of the '175 Patent has been knowing and willful.

238. Upon information and belief, Defendants' actions have caused Best to suffer irreparable harm resulting from the abuse of its lawful patent rights, including the ability to exclude others from the market. Upon information and belief, Defendants will continue these infringing acts unless enjoined by this court.

COUNT 10: DIRECT INFRINGEMENT OF THE '490 PATENT

239. Plaintiff repeats and realleges the allegations set forth in paragraphs 1-238 above as if fully set forth herein.

240. This cause of action arises under the patent laws of the United States, including 35 U.S.C. §§ 271 *et seq.*

241. The '490 Patent was duly and lawfully issued by the USPTO on March 21, 2006, to listed co-inventors Duan Qiang Wang, Robert W. Hill, and Simon Chun-pin Lam. *See Exhibit D, Cover.*

242. Plaintiff is the owner by assignment of all right, title, and interest in and to the '490 Patent. Evidence of the assignment of the '490 Patent from co-inventors Hill and Lam to Nomos Corporation is recorded at the USPTO at Reel 016910, Frame 0448, from co-inventor Wang to Nomos Corporation at Reel 016922, Frame 0363, and from Nomos Corporation to Plaintiff at Reel 020062, Frame 0709.

243. The '490 Patent is titled "Method and Apparatus for Optimization of Collimator Angles in Intensity Modulated Radiation Therapy Treatment." *See Exhibit D, Cover*.

244. The '490 Patent is directed to, *inter alia*, methods and apparatuses for determining an optimum collimator angle of a multi-leaf collimator having an opening and multiple leaf pairs for closing portions of the opening to form a radiation beam arrangement having multiple radiation beam segments. *See Exhibit D, Abstract*. One of the [1] apparatuses claimed in the '490 Patent for use in conformal radiation therapy of a target tumor comprises [2] a multi-leaf collimator having a plurality of selectable discrete collimator angles, an opening to pass a radiation beam, and a plurality of multi-leaf collimator leaf pairs to close portions of the opening to form a radiation beam arrangement having a plurality of radiation beam segments; and [3] a computer in communication with the multi-leaf collimator to form the radiation beam arrangement incorporating a cost function to determine a collimator angle of the multi-leaf collimator to thereby enhance the radiation beam arrangement, the cost function including both parameters to enhance conformity of the radiation beam arrangement to a shape of the target, and parameters to enhance delivery efficiency by reducing a number of segments and reducing a number of monitor units required for delivery of a desired radiation prescription. *See Exhibit C, Claim 17*.

245. As detailed in paragraphs 34 to 67 above, Defendants had knowledge of the '490

Patent and their infringement thereof by no later than January 26, 2012.

246. Upon information and belief, each of the Defendants has been and is now directly infringing, literally and/or under the doctrine of equivalents, under 35 U.S.C. § 271(a), one or more claims of the '490 Patent, including at least Claims 1, 4, and 17-19 of the '490 Patent, by making, using, selling, offering for sale, importing, and/or advertising in the United States at least Defendants' Clinac® linear accelerator (*see Exhibit E*), Clinac® iX linear accelerator (*see Exhibit R*), VitalBeam® Radiotherapy System (*see Exhibit F*), Trilogy® System (*see Exhibit G*), TrueBeam® Radiotherapy System (*see Exhibit H*), and Halcyon™ Radiotherapy System (*see Exhibit Q*), in conjunction with at least Defendants' Eclipse™ Treatment Planning System (*see Exhibit I*) and/or Defendants' RapidPlan™ Knowledge-Based Planning System (*see Exhibit J*) and/or Defendants' RapidArc® Planning System (*see Exhibit K*).

247. Upon information and belief, Defendants' linear accelerators, including the Clinac® linear accelerator, Clinac® iX linear accelerator, VitalBeam® Radiotherapy System, Trilogy® System, and TrueBeam® Radiotherapy System, in conjunction with at least Defendants' Eclipse™ Treatment Planning System and/or Defendants' RapidPlan™ Knowledge-Based Planning System and/or Defendants' RapidArc® Planning System, provide apparatuses as set forth in at least Claim 17-19 of the '490 Patent.

248. Upon information and belief, Defendants' TrueBeam® radiotherapy system "enables clinicians to treat a wider array of cancer cases using a diverse range of radiation therapies," which uses "intensity-modulated radiation therapy (IMRT)" where a "High Definition 120 leaf [multi-leaf collimator] MLC sculpts dose with high conformity for precise tumor targeting." *See Exhibit H, p. 6.* Thus, the TrueBeam® radiotherapy system is an [1] apparatus as claimed in the '490 Patent for use in conformal radiation therapy of a target

tumor comprising [2] a multi-leaf collimator having a plurality of selectable discrete collimator angles, an opening to pass a radiation beam, and a plurality of multi-leaf collimator leaf pairs to close portions of the opening to form a radiation beam arrangement having a plurality of radiation beam segments.

249. Upon information and belief, Defendants' TrueBeam® radiotherapy system "is uniquely capable of integrating hardware and software" and thus comprises [3] a computer in communication with the multi-leaf collimator to form the radiation beam arrangement incorporating a cost function to determine a collimator angle of the multi-leaf collimator to thereby enhance the radiation beam arrangement, the cost function including both parameters to enhance conformity of the radiation beam arrangement to a shape of the target, and parameters to enhance delivery efficiency by reducing a number of segments and reducing a number of monitor units required for delivery of a desired radiation prescription. *See Exhibit H, p. 2.*

250. That Defendants' Accused Products have infringed the '490 Patent is further supported by information made public as a result of the ITC Matter. *See Exhibit M*.

251. For example, the Final Initial Determination in the ITC Matter states that "RapidArc is a VMAT treatment technology sold by Varian. It includes both treatment planning and treatment delivery components. For treatment planning, it consists of optimization algorithms used within Eclipse for developing VMAT treatment plans. For treatment delivery, it consists of hardware modifications to TrueBeam (including Edge) and Clinac (including Clinac iX and Trilogy) treatment delivery platforms to enable delivery of VMAT treatment plans." *See Exhibit M, p. 268*.

252. RapidArc treatment plans use the PRO [Progressive Resolution Optimizer] algorithm to optimize the dose distribution delivered to the patient target volume. *See Exhibit M,*

p. 336.

253. Upon information and belief, Defendants' RapidArc® radiotherapy system is an [1] apparatus as claimed in the '490 Patent for use in conformal radiation therapy of a target tumor comprising [2] a multi-leaf collimator having a plurality of selectable discrete collimator angles, an opening to pass a radiation beam, and a plurality of multi-leaf collimator leaf pairs to close portions of the opening to form a radiation beam arrangement having a plurality of radiation beam segments. *See Exhibit K.*

254. The Final Initial Determination in the ITC Matter further states that Varian's Eclipse treatment planning system causes the computer processor to optimize a treatment plan using the PRO algorithm:

> The PRO algorithm optimizes a simulated dose distribution along the treatment trajectory relative to the clinical objectives input into the Eclipse software, including the desired dose distribution. The clinical objectives are embodied in a cost function. The PRO algorithm [for example] includes multiple levels of optimization, called MR levels, and each MR level includes a series of iterations where the simulated dose distribution is optimized**. At each iteration, the PRO algorithm attempts to improve the cost function by adjusting dose amounts and MLC leaf positions at different points along the trajectory**.

Exhibit M, pp. 336-337 (emphasis added).

255. Upon information and belief, in Defendants' Eclipse, "[t]he PRO algorithm generates a sequence of control points which define MLC leaf positions and MU/deg as a function of gantry angle." *See Exhibit O, p. 205.*

256. The Final Initial Determination in the ITC Matter further states that in Varian's Eclipse treatment planning system, "[t]**he PRO algorithm optimizes** a simulated dose distribution along the treatment trajectory relative to the clinical objectives, **including the desired dose distribution to the patient target volume and surrounding tissue**." *See Exhibit*

M, p. 270 (emphasis added).

257. In terms of reducing the monitor units, Defendants' Eclipse Photon and Electron Algorithms Reference states that in the Eclipse treatment planning system:

> **[t]he MU [Monitor Units] objective can be used to control the number of MU that the PO [Photon Optimization] or PRO optimizer produces.** Minimum and maximum values can be defined. An extra multiplier is applied to the total objective function value if the number of MU is not in the desired range, Strength value can be used to modify the strength of the effect.

Exhibit O, p. 181 (emphasis added).

258. In terms of reducing the number of segments, Defendants' Eclipse Reference Guide states that:

> Eclipse IMRT is capable of creating highly conformal dose distributions by optimizing the beam intensity modulation from user-defined dose volume objectives. The algorithm used in Eclipse IMRT, Dose Volume Optimizer (DVO), **determines the optimal field shape and intensity** by iteratively conforming the dose distribution to the desired objectives until an optimum solution is reached.

Exhibit O, p. 194 (emphasis added).

259. Upon information and belief, in Defendants' Eclipse treatment planning system, the PRO algorithm balances sparing of the various OARs [organs-at-risk], depending on the assigned optimization priorities, and optimization priorities can be adjusted in order to meet user-specific criteria for PTV [planning target volume] dose coverage and homogeneity, and dose homogeneity can be achieved by reducing number of beam segments.

260. As such, Defendants' Accused Products also include [3] a computer in communication with the multi-leaf collimator to form the radiation beam arrangement incorporating a cost function to determine a collimator angle of the multi-leaf collimator to thereby enhance the radiation beam arrangement, the cost function including both parameters to enhance conformity of the radiation beam arrangement to a shape of the target, and parameters to

enhance delivery efficiency by reducing a number of segments and reducing a number of monitor units required for delivery of a desired radiation prescription, or an equivalent thereof.

261. Upon information and belief, Defendants' past and ongoing direct infringement of the '490 Patent has and will continue to irreparably harm Best.

262. Upon information and belief, Defendants' past and ongoing direct infringement of the '490 Patent has and will cause Best damages.

263. As detailed in paragraphs 34 to 67 above, Defendants' past and ongoing direct infringement of the '490 Patent has been knowing and willful.

264. Upon information and belief, Defendants' actions have caused Best to suffer irreparable harm resulting from the abuse of its patent rights, including the ability to exclude others from the market. Upon information and belief, Defendants will continue these infringing acts unless enjoined by this court.

COUNT 11: INDIRECT INFRINGEMENT OF THE '490 PATENT BY INDUCEMENT

265. Plaintiff repeats and realleges the allegations set forth in paragraphs 1-264 above as if fully set forth herein.

266. Defendants have been aware of the '490 patent since at least the filing of the Complaint in this action on October 16, 2018, yet continue their own infringing activity as well as their inducement of infringement by their customers.

267. The Complaint in this action, filed on October 16, 2018, provided Defendants with knowledge of the '490 patent.

268. The Complaint in this action, filed on October 16, 2018, also provided Defendants with knowledge of infringement caused by using, making, using, selling, offering for sale, importing, and/or advertising in the United States of Defendants' Accused Products.

269. Defendants' continued making, using, selling, offering for sale, importing, and/or advertising of Defendants' Accused Products demonstrates that Defendants specifically intend to induce their customers to infringe.

270. Upon information and belief, Defendants had knowledge of the '490 Patent and their infringement thereof prior to the filing of the Complaint on October 16, 2018.

271. As detailed above in paragraphs 34 to 67, Defendants had knowledge of the '490 Patent and their infringement thereof by no later than January 26, 2012.

272. Upon information and belief, Defendants are liable for inducing infringement of the '490 Patent under 35 U.S.C. § 271(b) by having knowledge of the '490 Patent prior to the filing of the Complaint in this action on October 16, 2018, as set forth above, and knowingly causing or intending to cause, and continuing to knowingly cause or intend to cause, direct infringement of the '490 Patent, with specific intent, by their customers.

273. Defendants' continued making, using, selling, offering for sale, importing, and/or advertising of Defendants' Accused Products demonstrates that Defendants specifically intend to induce their customers to infringe the '490 patent.

274. Upon information and belief, Defendants actively induce infringement of the '490 Patent by, *inter alia*, training their customers on the use of the Accused Products and/or promotion, sales, and/or importation of the Accused Products to Defendants' customers.

275. Upon information and belief, Defendants' customers for the Accused Products directly infringe the '490 Patent by, *inter alia*, using the Accused Products.

276. Upon information and belief, Defendants intend to, and continue to intend to, indirectly infringe the '490 Patent by inducement by selling the Accused Products for use by Defendants' customers.

277. Upon information and belief, Defendants knew or should have known of the ’490 Patent and have acted, and continue to act, in an egregious and wanton manner by infringing the ’490 Patent.

278. Upon information and belief, despite knowing that their actions constituted induced infringement of the ’490 Patent and/or despite knowing that there was a high likelihood that their actions constituted induced infringement of the ’490 Patent, Defendants nevertheless continue their infringing actions, and continue to make, use, offer for sale, and sell the Accused Products.

279. Upon information and belief, Defendants’ acts of infringement of the ’490 Patent have and will continue to irreparably harm Best.

280. Upon information and belief, Defendants’ past and ongoing induced infringement of the ’490 Patent has and will cause Best damages.

281. As detailed in paragraphs 34 to 67 above, Defendants’ past and ongoing induced infringement of the ’490 Patent has been knowing and willful.

282. Upon information and belief, Defendants’ actions have caused Best to suffer irreparable harm resulting from the abuse of its lawful patent rights, including the ability to exclude others from the market. Upon information and belief, Defendants will continue these infringing acts unless enjoined by this court.

COUNT 12: INDIRECT INFRINGEMENT OF THE ’490 PATENT BY CONTRIBUTORY INFRINGEMENT

283. Plaintiff repeats and realleges the allegations set forth in paragraphs 1-282 above as if fully set forth herein.

284. As detailed in paragraphs 34 to 67 above, Defendants had knowledge of the ’490

Patent and their infringement thereof by no later than January 26, 2012.

285. Upon information and belief, Defendants are liable for contributory infringement of the ’490 Patent under 35 U.S.C. § 271(c) by, *inter alia*, having sold or offered to sell, and continuing to sell or offer to sell, the Accused Products within the United States and/or by importing the Accused Products into the United States because the Accused Products constitute a material part of the invention embodied in the ’490 Patent, which, upon information and belief, Defendants know to be especially made and/or especially adapted for use in infringement of the ’490 Patent, and which are not staple articles or commodities of commerce suitable for substantial non-infringing use.

286. Defendants’ marketing literature and other documents do not propose any non-infringing use for the Accused Products, substantial or otherwise. Rather, the only proposed use for the Accused Products identified in Defendants’ marketing literature and other documents is to eradicate tumors while minimizing damage to healthy tissues and organs surrounding those tumors. As such, the Accused Products are marketed solely for use to eradicate tumors while minimizing damage to healthy tissues and organs surrounding those tumors.

287. The Eclipse treatment planning system is for conformal radiation therapy, IMRT and VMAT therapy and when a treatment plan is created and optimized by Eclipse and is used with a Varian LINAC, that creating of the plan and such use constitutes infringement of the ‘490 Patent.

288. Upon information and belief, Defendants are liable for contributory infringement of the ’490 Patent by having knowledge of the ’490 Patent and knowingly causing or intending to cause, and continuing to knowingly cause or intend to cause, direct infringement of the ’490 Patent by their customers, including, *e.g.*, end users of the Accused Products.

289. Upon information and belief, Defendants contribute to infringement of the '490 Patent by, *inter alia*, promotion, sales, and/or importation of the Accused Products to Defendants' customers, including, *e.g.*, end users who use apparatuses claimed in the '490 Patent and perform methods claimed in the '490 Patent. Upon information and belief, Defendants' customers directly infringe the '490 Patent by, *e.g.*, using the Accused Products.

290. Upon information and belief, Defendants' past and ongoing contributory infringement of the '490 Patent has and will continue to irreparably harm Best.

291. Upon information and belief, Defendants' past and ongoing contributory infringement of the '490 Patent has and will cause Best damages.

292. As detailed in paragraphs 34 to 67 above, Defendants' past and ongoing contributory infringement of the '490 Patent has been knowing and willful.

293. Upon information and belief, Defendants' actions have caused Best to suffer irreparable harm resulting from the abuse of its lawful patent rights, including the ability to exclude others from the market. Upon information and belief, Defendants will continue these infringing acts unless enjoined by this court.

DEMAND FOR JURY TRIAL

Plaintiff demands a trial by jury for all issues so triable.

PRAYER FOR RELIEF

WHEREFORE, Plaintiff respectfully requests that this Court enter:

294. A judgment in favor of Best declaring and adjudging that each of the Defendants has directly infringed, engaged in the contributory infringement of, actively induced others to infringe the '283 Patent, either literally or under the doctrine of equivalents;

295. A judgment in favor of Best declaring and adjudging that each of Defendants' infringement, contributory infringement, and active inducement of infringement of the '283 Patent was willful and deliberate;

296. A judgment in favor of Best requiring each of the Defendants to account for and pay over to Best all actual damages suffered by Best by reason of Defendants' infringement of the '283 Patent, including without limitation lost profits and/or reasonable royalty;

297. A judgment in favor of Best declaring and adjudging that each of the Defendants has directly infringed, engaged in the contributory infringement of, actively induced others to infringe the '096 Patent, either literally or under the doctrine of equivalents;

298. A judgment in favor of Best declaring and adjudging that each of Defendants' infringement, contributory infringement, and active inducement of infringement of the '096 Patent was willful and deliberate;

299. A judgment in favor of Best requiring each of the Defendants to account for and pay over to Best all actual damages suffered by Best by reason of Defendants' infringement of the '096 Patent, including without limitation lost profits and/or reasonable royalty;

300. A judgment in favor of Best declaring and adjudging that each of the Defendants has directly infringed, engaged in the contributory infringement of, actively induced others to infringe the '175 Patent, either literally or under the doctrine of equivalents;

301. A judgment in favor of Best declaring and adjudging that each of Defendants' infringement, contributory infringement, and active inducement of infringement of the '175 Patent was willful and deliberate;

302. An order of this Court permanently enjoining each of the Defendants and its officers, directors, agents, affiliates, employees, divisions, branches, subsidiaries, parents, and all

others in concert therewith from infringing, including inducing the infringement of and contributing to the infringement of, the ’175 Patent;

303. A judgment in favor of Best requiring each of the Defendants to account for and pay over to Best all actual damages suffered by Best by reason of Defendants’ infringement of the ’175 Patent, including without limitation lost profits and/or reasonable royalty;

304. A judgment in favor of Best declaring and adjudging that each of the Defendants has directly infringed, engaged in the contributory infringement of, actively induced others to infringe the ’490 Patent, either literally or under the doctrine of equivalents;

305. A judgment in favor of Best declaring and adjudging that each of Defendants’ infringement, contributory infringement, and active inducement of infringement of the ’490 Patent was willful and deliberate;

306. An order of this Court permanently enjoining each of the Defendants and its officers, directors, agents, affiliates, employees, divisions, branches, subsidiaries, parents, and all others in concert therewith from infringing, including inducing the infringement of and contributing to the infringement of, the ’490 Patent;

307. A judgment in favor of Best requiring each of the Defendants to account for and pay over to Best all actual damages suffered by Best by reason of Defendants’ infringement of the ’490 Patent, including without limitation lost profits and/or reasonable royalty;

308. A judgment and order requiring each of the Defendants to pay Best its damages, costs, expenses, pre-judgment interest, and post-judgment interest for each of Defendants’ infringement of any of the ’283 Patent, ’096 Patent, ’490 Patent, and ’175 Patent, as provided under 35 U.S.C. § 284.

309. A judgment in favor of Best trebling damages pursuant to 35 U.S.C. § 284 due to the willful and deliberate nature of each of the Defendants aforesaid infringing acts;

310. A judgment and order finding that this is an exceptional case within the meaning of 35 U.S.C. § 285, and award to Best its reasonable attorneys' fees; and

311. An Order for any and all other relief to which Best may show itself to be entitled and/or as the Court may deem just and proper.

Dated: September 9, 2019

/s/ Geoffrey G. Grivner

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